CENTRAL INTELLIGENCE AGENCY

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C-O-N-F-I-D-E-N-T-I-A-L

50X1-HUM

COUNTRY	Hungary
SUBJECT	Catalogue of Electric Machinery and Instruments

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50X1-HUM

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50X1-HUM

SOURCE EVALUATIONS ARE DEFINITIVE.   APPRAISAL OF CONTENT IS TENTATIVE.

catalogue, issued by the Metrimpex foreign-trade agency in Budapest, entitled "Elements for Automatic Control." and apparently showing machinery and instruments

50X1-HUM

When detached from this cover, it may be regarded as unclassified.

50X1-HUM

C-O-N-F-I-D-E-N-T-I-A-L

50X1-HUM

STATE		ARMY		NAVY		AIR		FBI		AEC						
	X		X		X		X									

(Note: Washington distribution indicated by "X"; Field distribution by "#".)

ELEMENTS
for
AUTOMATIC
CONTROL

50X1-HUM
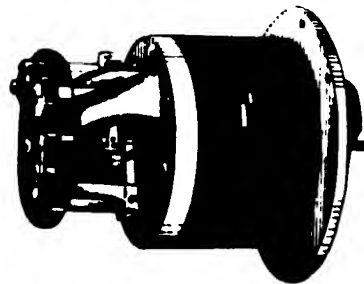
METRIMPEX

ELEMENTS for AUTOMATIC CONTROL

This catalogue deals with the small rotating engines, precision potentiometers and other apparatus manufactured by our firm, required and used in automatic control systems. In their design the following requirements have been considered:

1. They should be adaptable for solving problems of industrial automation, in electrical computing and evaluating machines and for control purposes.

2. In spite of their small size and light weight they should fulfil their task to a high value of accuracy.

3. Design, materials and construction were chosen with the aim, that they shall ensure stability under special climatic effects. Our products are capable to operate at temperatures varying between -40° C $/-75^\circ$ F/ and $+70^\circ$ C $/+158^\circ$ F/, as well as in air of any moisture content.

From the point of view of accuracy our apparatus are classified into various precision classes, so that they shall be capable to fulfil all requirements concerning their actual use.
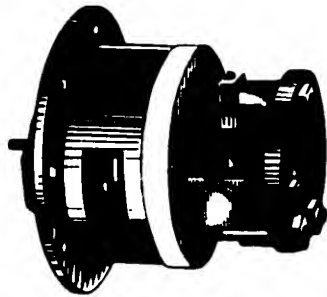
- 3 -

2S2-S1 *Synchro*

This is used as a transmitting unit for remote indication of angular displacements.

	2S2-S1
Excitation voltage	110 V
Frequency	500 Hz
Excitation current	0.35 A
Primary impedance	320/75° Ohm
Secondary voltage	210 V
Rotor inertia	60 grcm
Friction	5 grcm
Angular accuracy 1. Class I	0.25°
Class II	0.5°
Class III	1.0°
Number of receiver synchros to be connected max.	4 pieces 2S1-S1 or 8 pieces 1S1-S1
Test voltage to body	1000 V_{eff}
Weight	0.4 kg

Note:

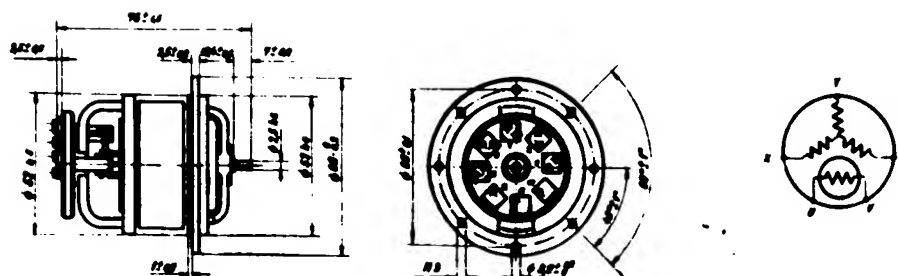1. In this column the permissible magnitude of the electric asymmetry is given.

- 5 -
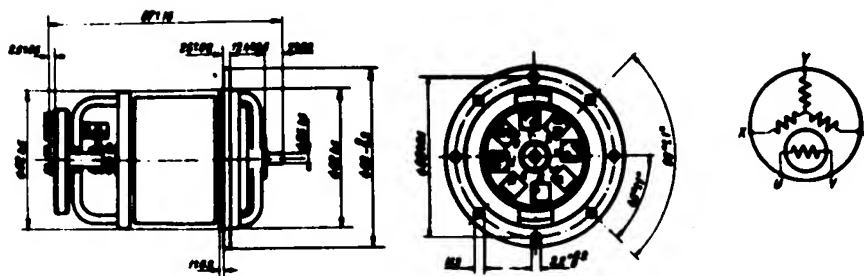
2S1-S *Synchro*

This is used as a receiver unit for remote indication of angular displacements. It is provided with an electrical damping coil to ensure oscillation-free operation.

	2S1-S1
Excitation voltage	110 V
Frequency	500 Hz
Excitation current	0.2 A
Primary impedance	550/72° Ohm
Secondary voltage	210 V
Angular accuracy 1. Class I	0.5°
Class II	0.75°
Class III	1.5°
Specific return torque connected to 2S2-S1 transmitter	3 grcm/degree
Test voltage to body	1000 V_{eff}
Weight	0.3 kg

Note

1. This dates apply only when connected to a 2S2-S1 transmitter Class I.
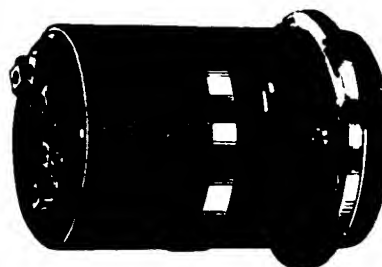
-4-

351-S *Synchro*

This is used as a receiver unit for remote indication of angular displacements. It is provided with an electrical damping coil to ensure oscillation-free operation.

	351-82	351-84
Excitation voltage	110 V	150 V
Frequency	50 Hz	30 Hz
Excitation current	0.22 A	0.2 A
Primary impedance	500/65° Ohm	750/75° Ohm
Secondary voltage	130 V	165 V
Angular accuracy 1.		
Class I	0.5°	0.5°
Class II	1.0°	1.0°
Class III	1.5°	1.5°
Specific return torque	with 351-81 transmitter	with 351-83 transmitter
	9 grcm/degree	8 grcm/degree
Weight	1.33 kg	1.33 kg

Note

1. This dates apply only when connected to a transmitter Class 1.

- 7 -
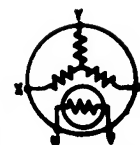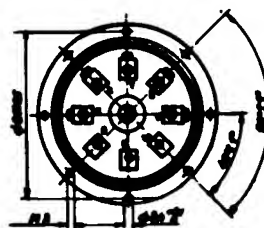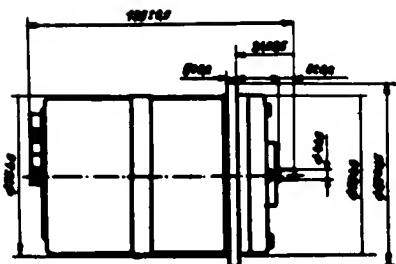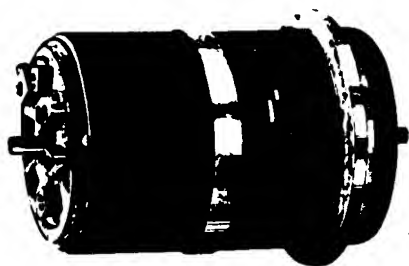
3S1-S *Synchro*

This is used as a transmitting unit for remote indication
of angular displacements.

	3S1-S1	3S1-S3	3S1-S5
Excitation voltage	110 V	150 V	110 V
Frequency	50 Hz	30 Hz	500 Hz
Excitation current	0.22 A	0.16 A	0.5 A
Primary impedance	500 Ohm	900 Ohm	220 Ohm
Secondary voltage	130 V	165 V	210 V
Rotor inertia	320 grcm^2	320 grcm^2	320 grcm^2
Friction	25 grcm^2	25 grcm^2	25 grcm^2
Angular accuracy 1.			
Class I	0.3°	0.3°	0.3°
Class II	0.75°	0.75°	0.75°
Class III	1.0°	1.0°	1.0°
Number of receiver synchros to be connected max.	1 piece 3S1-S2	1 piece 3S1-S4	1 piece 3S1-S1
Test voltage to body	1000 V_{eff}	1000 V_{eff}	1000 V_{eff}
Weight	1.3 kg	1.3 kg	1.3 kg

Note

1. In this column the permissible magnitude of the electric
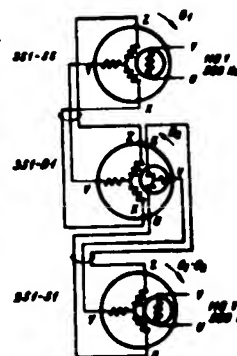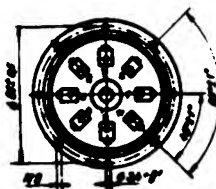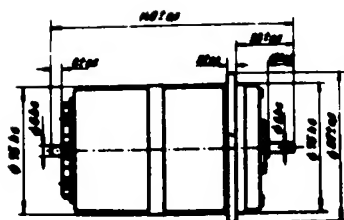   asymmetry is given.

- 6 -
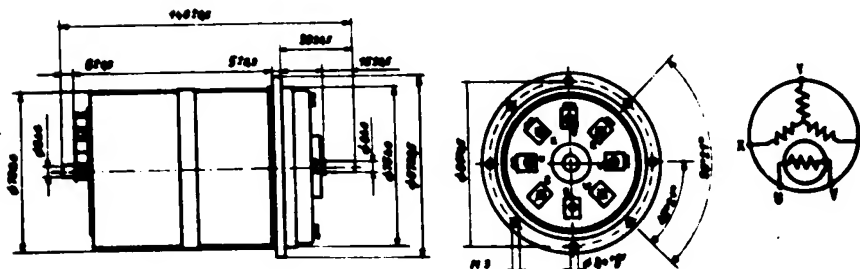
3S1-D *Differential Synchro*
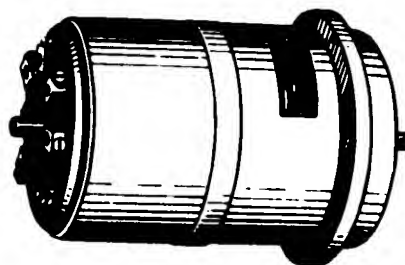
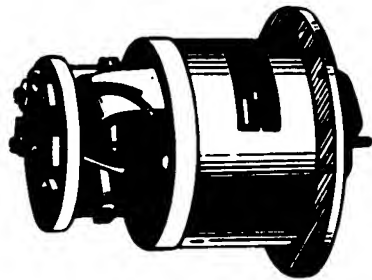This can be used for evaluating angular differences or sums.

	3S1-D1
Frequency	500 Hz
Primary voltage	210 V
Primary impedance	2800 Ohm
Secondary voltage	210 V
Secondary impedance	2800 Ohm
Angular accuracy 1.	
Class I	0.5°
Class II	0.75°
Class III	1.5°
Test voltage to body	1000 V_{eff}
Weight	1.3 kg

Note

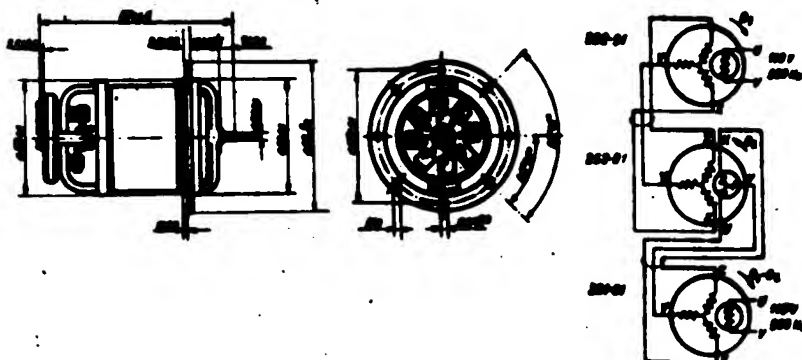1. In this column the permissible magnitude of the electric asymmetry is given.

- 9 -

2S2-D *Differential Synchro*

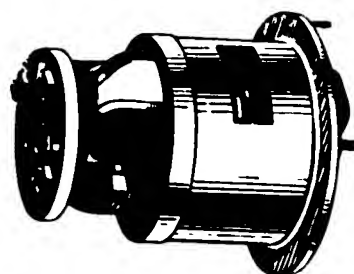This can be used for evaluating angular differences or sums.

	2S2-D
Frequency	500 Hz
Primary voltage	210 V
Primary impedance	3800 Ohm
Secondary voltage	210 V
Secondary impedance	3800 Ohm
Angular accuracy 1.	
Class I	0.5°
Class II	0.75°
Class III	1.5°
Test voltage to body	1000 V_{eff}
Weight	0.4 kg

Note

1. In this column the permissible magnitude of the electric asymmetry is given.
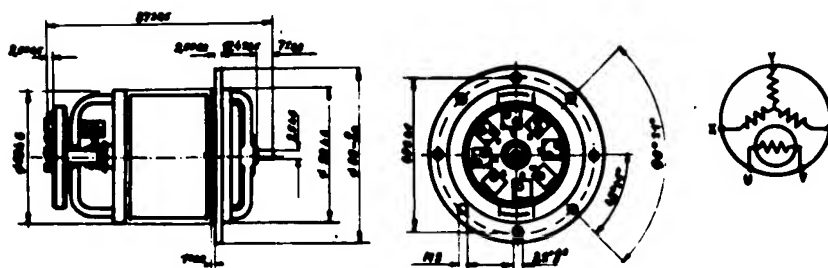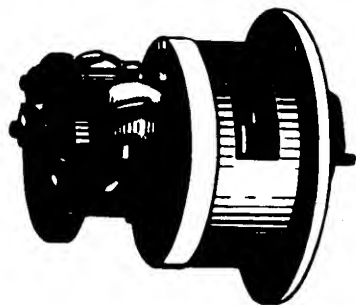
- 8 -

2S2-C *Controlling Transformer*

This can be used as a transmitter unit for the indication of angular position

	2S2-C1
Excitation voltage	24 V
Frequency	50 Hz
Excitation current	85 mA
Primary impedance	280 Ohm
Secondary voltage	35 V
Angular accuracy 1.	
Class I	0.25°
Class II	0.5°
Class III	0.75°
Input power connected to one 2S1-C3	4 W

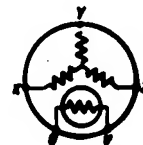**Note**

1. In this column the permissible magnitude of the electric asymmetry is given.
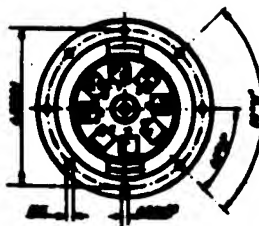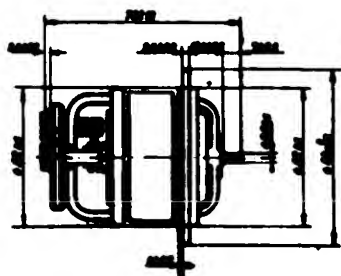
- 11 -

2S1-C *Controlling Transformer*

This can be used as a receiver unit for the indication of angular position.

	2S1-C1	2S1-C3
Excitation voltage	35 V	210 V
Frequency	150 Hz	500 Hz
Excitation current	90 mA	100 mA
Primary impedance	220 Ohm	2100 Ohm
Max. Secondary voltage	30 V	380 V
Transconductance	0.32V/degree	6 V/degree
Angular accuracy:		
Class I	0.2°	0.25°
Class II	0.5°	0.5°
Class III	1.0°	1.0°
Weight		0.3 kg

3S1-R *Resolver*

For resolution of angles. Its output voltage is proportional
to the excitation voltage and to the sine, vis. cosine of
angular displacement. The feed-back coils having identical
number of turns with those of the excitation coils, provide
feeding from a feed-back amplifier.

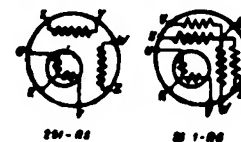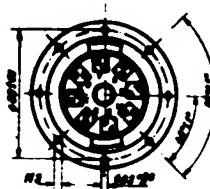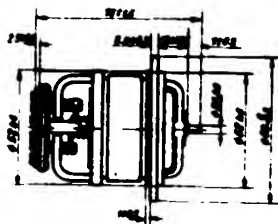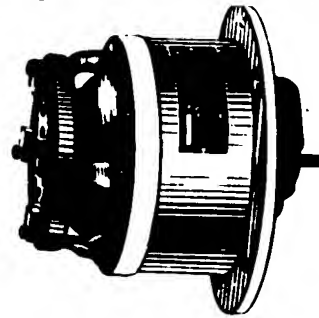|	3S1-R1
Voltage	60 V
Frequency	500 Hz
Excitation current	30 mA
Impedance	$2000/64°$ Ohm
Tuned-out impedance	4200 Ohm
Coefficient of transformation	1:1 -1.5%
Differences in transformation coefficients between coils	
Class I	0.1%
Class II	0.5 %
Class III	1 %
Accuracy of angular resolution	
Class I	3'
Class II	10'
Class III	15'
Rotor inertia	320 $grcm^2$
Weight	1.3 kg
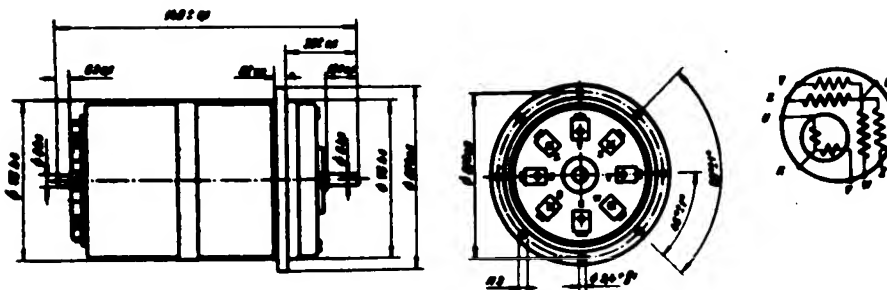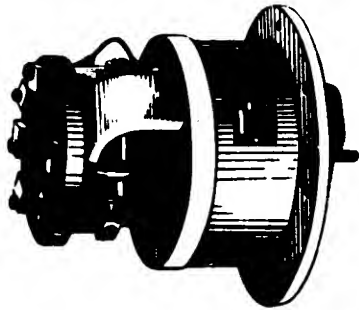
2 S1 R *Resolver*

For resolution of angles. Its output voltage is proportional to the excitation voltage and to the sine, vis. cosine of angular displacement. The feed-back coils of the 2S1-R6 type having identical number of turns with those of the excitation coils, provide feeding from a feed-back amplifier.

	2S1-R5	2S1-R6 with measuring coil
Voltage	60 V	60 V
Frequency	500 Hz	500 Hz
Excitation current	40 mA	40 mA
Impedance	$1500/72^\circ$ Ohm	$1500/72^\circ$ Ohm
Tuned-out impedance	4300 Ohm	4600 Ohm
Coefficient of transformation	1:1 -2%	1:1 -1.5%
Differences in transformation coefficients between coils:		
Class I	0.5%	0.15%
Class II	1 %	0.5%
Class III	1.5%	1 %
Accuracy of angular resolution:		
Class I	10'	3'
Class II	15'	10'
Class III	20'	15'
Rotor inertia	30 $grcm^2$	30 $grcm^2$
Weight	0.3 kg	0.3 kg

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2M1 *Servomotor*

Two-phase servo motor with rotor of small inertia.

|	2M1-42	2M1-43
Main phase voltage	110 V	55 + 55 V
Auxiliary phase voltage	110 V	110 V
Frequency	500 Hz	500 Hz
Current consumption	0.09 A	0.09 A
Impedance	1200 Ohm	1200 Ohm
Rotor inertia	2.7 grcm^2	2.7 grcm^2
Maximum acceleration	20000 1/sec^2	20000 1/sec^2
Maximum torque	55 grcm	55 grcm
Number of revolutions during no-load run	12500 1/min	12500 1/min
Maximum output power	2.3 W	2.3 W
No-load input, main phase	3.1 W	3.1 W
Locked-rotor input, main phase	8.2 W	8.2 W
Overheating	60°	60°
Weight	0.3 kg	0.3 kg
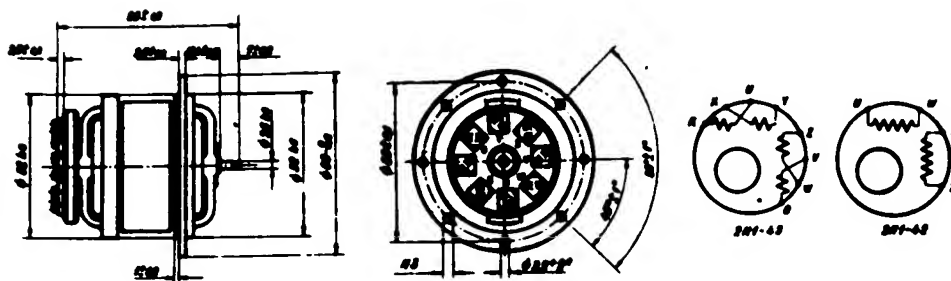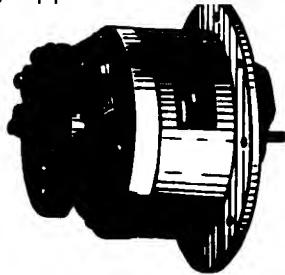
2V1 Velodyne

The output voltage of a Velodyne is proportional to the
excitation voltage and the speed of rotation. The feed-
back coils having identical number of turns with those
of the excitation coils, provide feeding from a feed-back
amplifier.

	2V1-42
Excitation voltage max.	60 V
Frequency	500 Hz
Excitation current	45 mA
Input impedance	1300 Ohm
Input power	2.5 W
Output impedance	3400 Ohm
Output voltage	3.5 V/1000 rev./min.
Phase angle between input and output	$55° \pm 5°$
Variation of phase angle	$5°$
Residual voltage 1.	max. 20 mV
Variation of residual voltage 2.	10 mV
Linearity: in the range from 100 to 5000 revolutions per minute	
Class I	$5°/oo$
Class II	1 %
Weight	0.3 kg

Note:

1. This should be understood in fully compensated state.
   Compensation is effected by the voltage applied to
   terminals s-k.

2. Within one revolution, because of asymmetry due to the
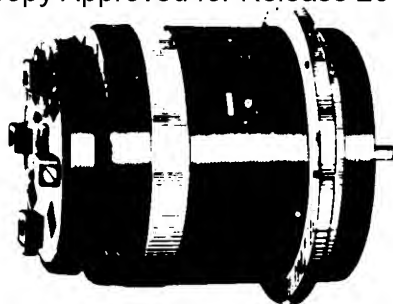   manufacture.

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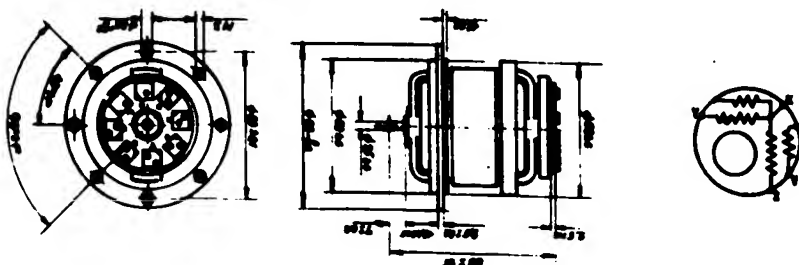
6K1-M *Commutator D-C motor*
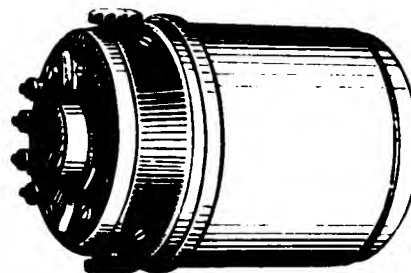
This is a direct current commutator shunt motor.

	6K1-M1	6K1-M2
Voltage	24 V	110 V
Type of current	d.c.	d.c.
Type of connection	Shunt	Shunt
Rated current	2.6 A	0.5 A
Rated input	62.5 W	55 W
Rated output	30 W	26 W
Rated speed of rotation	6000/min	4000/min
Rated torque	500 grcm	650 grcm
Overheating	60° C	60° C
Weight	1.05 kg	1.05 kg

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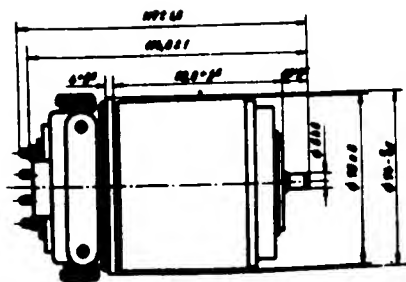
3M1 *Servomotor*

Two-phase servo motor with rotor of small inertia.

	3M1-42	3M1-21
Main phase voltage	110 V	110 V
Auxiliary phase voltage	110 V	110 V
Frequency	500 Hs	50 Hs
Current consumption	0.27 A	0.35 A
Impedance	400 Ohm	300 Ohm
Rotor inertia	23 grcm^2	23 grcm^2
Maximum acceleration	18000 1/sec^2	30000 1/sec^2
Maximum torque	420 grcm	700 grcm
Maximum output power	18 W	4.5 W
No-load input, 1 phase	10 W	17 W
Locked-rotor input, 1 phase	50 W	23.5 W
Number of revolutions during no-load run	12500 1/min	2700 1/min
Overheating 1.	60°	85°
Weight	1/2 kg	1/2 kg

N o t e

1. The value of overheating as given here applies to the case when the motor is at standstill and only the auxiliary phase voltage is on, heat transfer being effected by radiation only. Prolonged operation of the 3M1-21 motor is possible only with the help of external, forced cooling.